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Improvements relating to pressure-sensitive copying sheets

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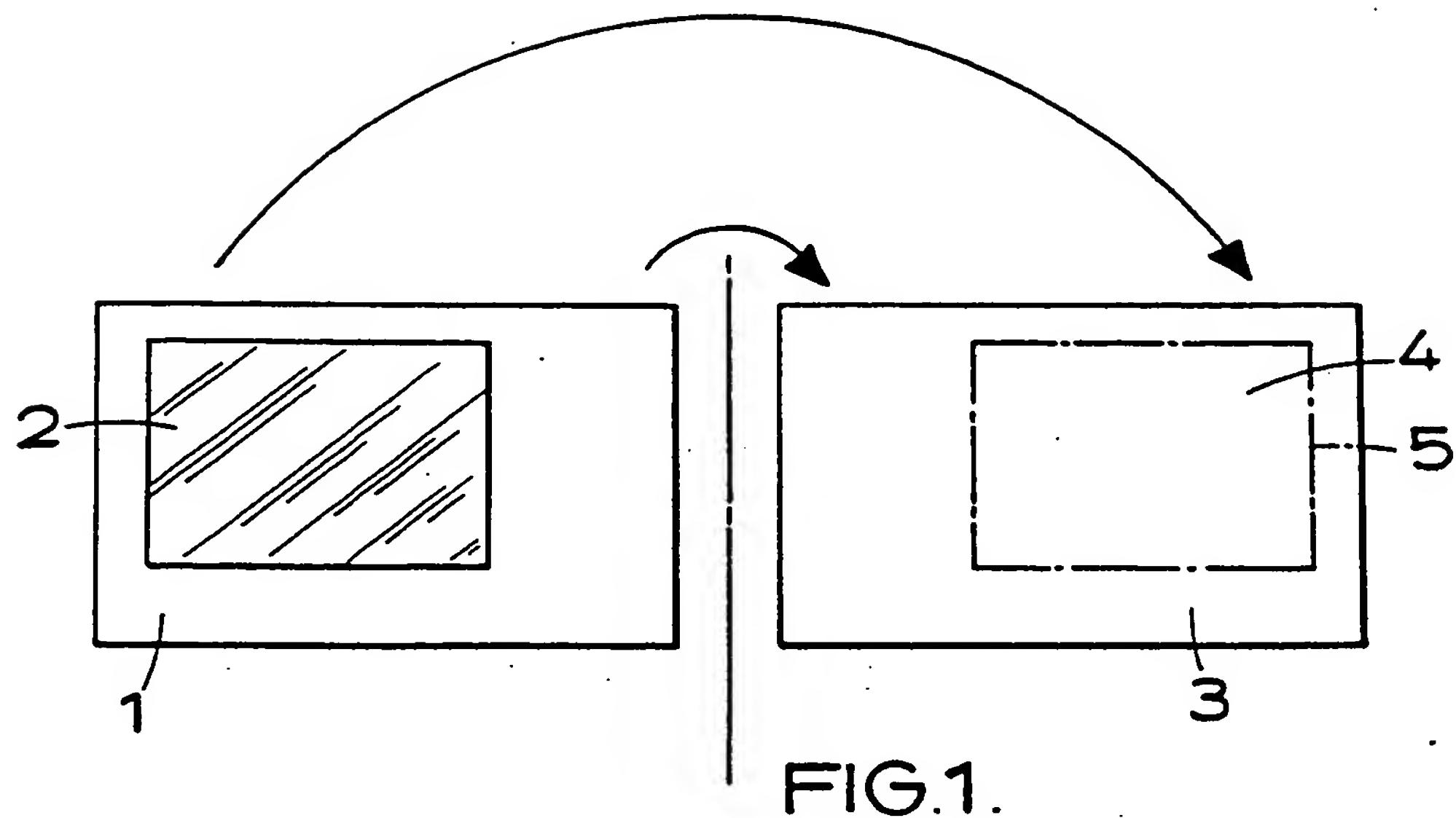


FIG.1.

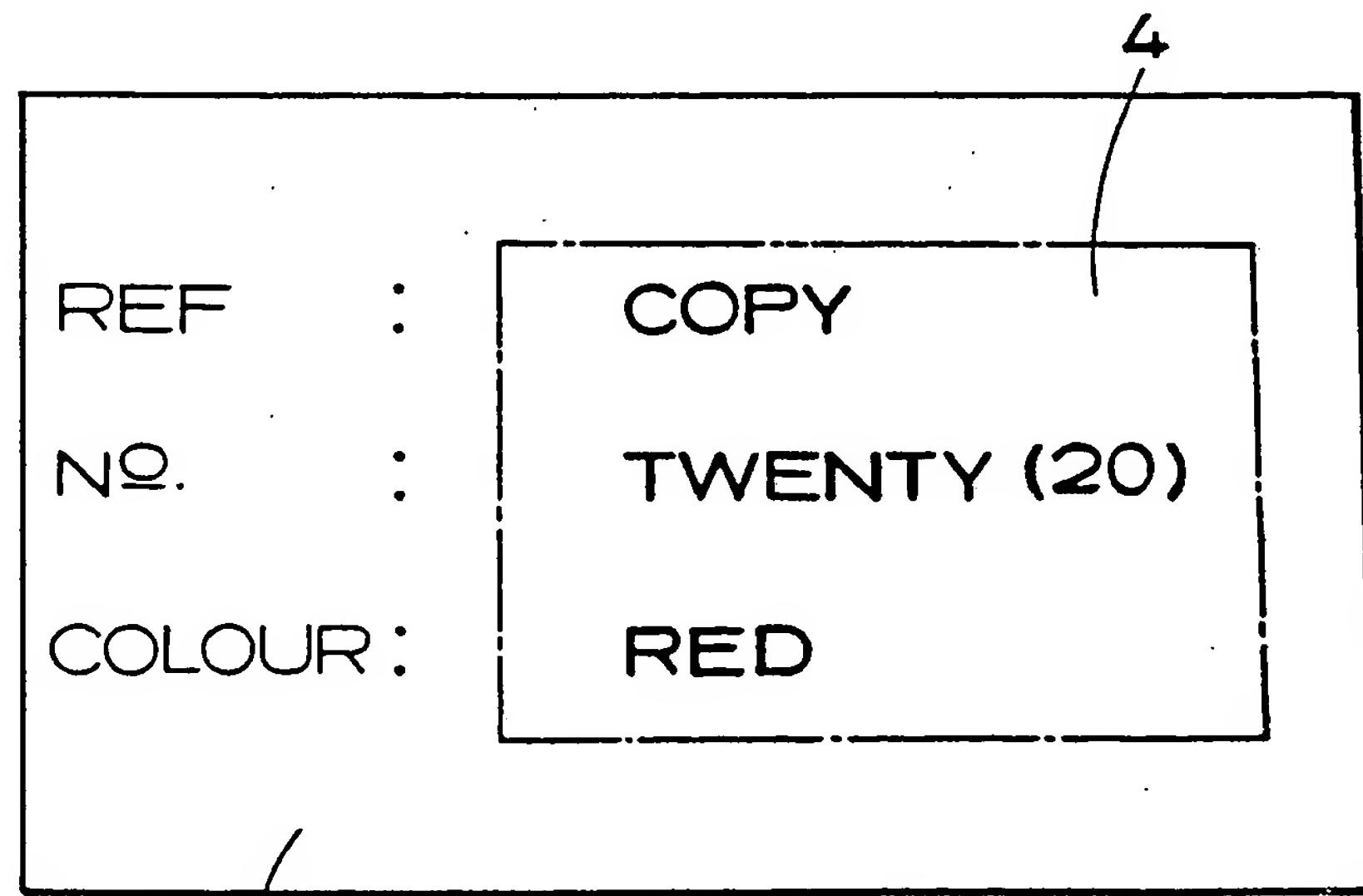


FIG.2.

& IMPROVEMENTS RELATING TO PRESSURE-SENSITIVE
COPYING SHEETS

5 This invention relates to pressure-sensitive copying sheets and more particularly to such sheets of the kind which enable copies to be obtained without the aid of carbon paper.

10 Pressure-sensitive copying sheets of the said kind are used extensively for applying copies of printed matter to documents, forms, correspondence and the like. They are used, for example, for copying information on to enclosures in envelopes, the original print being applied by typewriters or other pressure
15 applying printing means to sheets externally of the envelopes and being reproduced by means of the pressure-sensitive copying sheets, wholly or selectively, on the enclosures.

20 One known form of pressure-sensitive copying sheet has a carbon wax coating applied as a hot fluid to the back of it. When pressure is applied to the front of the sheet, as by typewriter keys, a trace of the carbon wax is transferred to a copy sheet behind the coated sheet. A bold trace can be produced from this type of copying sheet but a disadvantage of the sheet is that it tends to be dirty to use, the carbon wax coating rubbing off readily on to other surfaces, including a handler's hands, with which it may come into contact.
25 Furthermore, the trace transferred to a copy sheet is inclined to smudge because it is not stable and it may be erased without undue difficulty, which makes this type of copying sheet unsuitable for certain applications, such as in connection with bank cheques
30 on which erasure is unacceptable.

Pressure-sensitive carbonless copying sheets are also known. Sheets having what is called a CB coating, which contains one or more colour agents, on their back surfaces are used in combination with sheets having a coating known as a CF coating, which contains one or more colour developers, on their front surfaces. The sheets are used with the CB coating face to face with the CF coating. Usually the colour agent and colour developer are in microencapsulated forms. The CB and CF coatings are transparent and remain so until they are brought together and pressure is applied, for example by typewriter keys, to the sheets which causes the coatings to react and produce a marking on the CF coated surface where the pressure is applied. The marking is stable although it is generally quite pale and may not be as easily legible as a carbon wax trace. Such copying sheets are not entirely satisfactory where clear, legible marking is important, as in the case of bank cheques, or for micro-filming or photocopying.

According to a first aspect the present invention consists in a pressure-sensitive copying sheet which has a CB coating and has a dry carbon printing medium applied to the CB coating.

According to a second aspect the invention consists in pressure-sensitive copying sheets comprising a first sheet having a CF coating and a second sheet having a CB coating to which a dry carbon printing medium is applied.

It has been found that the addition of the dry carbon printing medium produces a marking when the CB coating reacts with a, or the, CF coating which is bolder than the markings generally produced hitherto by

the reaction between CB and CF coatings alone. Under applied pressure dry carbon transfers to the CF coating and the resultant marking comprises two components, the one being produced by the reaction of the CB and CF coatings and the other being of the transferred dry carbon. The dry carbon is secure on the marking. Thus a bold and stable marking can be produced.

10 The carbon may be of various colours, including black, blue, red and green. It may be in a combination of colours which may be in stripes or other patterns, which may be devised for security purposes.

15 Because of the dual layers of the marking it is both difficult to erase and to replace with a matching appearance, more especially when the carbon is in a combination of colours. An attempt to alter the marking, therefore, would be hard to conceal and so it will be appreciated that the invention may be used to advantage in respect of forms and documents, such as 20 cheques, as a deterrent to fraudulent alteration.

25 The boldness of the marking to be obtained by means of the invention may be varied to suit users' requirements by varying the screen density, and if desired the colour, of the dry carbon applied to the CB coating. Requirements may of course vary; in some instances users may consider the strength of the marking to be most important, in others security of the marking against alteration may be of primary 30 importance, and yet others may require both. It is essential that the carbon is not applied so densely that it could prevent the CB coating from reacting with a CF coating.

having CB coatings may be used to which the dry carbon printing medium is then applied. The dry carbon may be applied as required, and to selected parts of the CB coating, if desired. It will be understood that it is possible for markings to be produced on a CF coated sheet which may be the result either of a reaction between the CB and CF coatings alone or of such a reaction with the dry carbon addition so that a combination of pale and bold, possibly variously coloured, markings may be produced.

If the pressure-sensitive copying sheet in accordance with the first aspect of the invention is used with a plain uncoated sheet of bond paper, for example, when pressure is applied to the sheets, as by typewriter keys, the dry carbon will transfer to the plain sheet but the resultant marking is paler than that which may be obtained by the reaction between CB and CF coatings with the dry carbon addition.

The dry carbon printing medium may be a proprietary printing ink containing a lamp black suspension which is spread on to the CB coating and dried. When dried the application is substantially stable so that the sheet is clean to handle. In addition using such a printing ink the dry carbon can be expected to remain stable throughout the temperature ranges normally experienced in machinery with which pressure-sensitive copying sheets are in general use. The CB coating and dry carbon remain inactive until the sheet is subjected to concentrated pressure, as by typewriter keys.

Using a printing ink as just mentioned the dry carbon application may be cheaply and easily made.

It is common for CF coatings to be applied to selected areas of sheets to suit users' requirements. The present invention enables this still to be done. Similarly the dry carbon, as indicated above, may be selectively applied to the CB coatings to suit users' particular requirements.

Pressure-sensitive copying sheets in accordance with the invention may be incorporated into manifold forms, and into continuous assemblies, including assemblies for forming envelopes with enclosures. In the latter application sheets having the CB coating and applied dry carbon conveniently form front walls of the envelopes, the CB coating and dry carbon being at the inner sides of the front walls, and sheets having the CF coatings form the enclosures, the CF coatings facing the CB coatings and dry carbon for them to co-operate as pressure is exerted on the assembly by typewriter keys or other printing means. Detachable fly copy sheets will normally be positioned over the fronts of the envelope front wall sheets on to which the printing means will print directly. A copy of information printed onto the fly copy sheets is reproduced on the enclosures. Selected portions only of the information printed onto the fly copy sheets may be reproduced on the enclosures. The enclosure sheets may have printed matter applied to them before they are assembled with the front wall-forming sheets of the envelopes, and then when the sheets are all assembled together particular information may be copied on to the enclosures as it is printed onto the fly copy sheets.

The enclosures may be bank cheques, being of the appropriate quality paper having a CF coating at the areas where the dates, names of the payees and amounts to be paid are to be entered. The enclosures may be of

other kinds, including plastics cards and even self-adhesive labels.

5 An embodiment of the first and second aspects of the invention will now be described, purely by way of example, with reference to the accompanying drawings of which:-

10 Figure 1 is a schematic representation of a sheet of CB paper with a region coated with dry carbon placed next to a corresponding sheet of CF paper; and

15 Figure 2 illustrates a copy produced on the CF sheet of Figure 1.

Figure 1 shows a sheet of CB paper 1, a region 2 of which has a dry carbon coating applied over its active CB surface which in use faces the CF surface of 20 a sheet of corresponding CF paper 3. Suitable CB and CF paper can be obtained from Wiggins Teape of UK, or Mead Corporation of USA, or Appleton Papers of U.S.A. The region 4 of the CF paper that is to be over-laid by the dry carbon coated region 2 of the CB paper is 25 outlined by the chain dot line 5.

30 Printing occurs on a top copy sheet (not shown) and the pressure of the printing characters is transferred to the CF sheet through the CB sheet lying on top of it. Figure 2 illustrates the contrast which can be achieved between the copy obtained from the CB/CF reaction alone and that obtained from the area 4 coated with the dry carbon.

35 The dry carbon coating is in this example black cold carbon printing ink, which is a carbon suspension

in a viscous printing medium such as a resin. The medium may include a dye or pigment so that instead of being black it may be another high contrast colour such as red, blue or green.

5

The viscous printing medium is such that permanent bonding of the medium to the CB paper is precluded. This may be achieved by the surface tension of the medium. The lack of bonding of the printing ink to the CB paper allows the transfer of the printing ink to the CF paper. Migration through the printing ink during the printing process of the colour agent of the CB paper, or the developer of the CF paper, or both, is permitted so that the colour agent and developer can react.

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Two or more different areas of different colour dry carbon coating could be used. For example the word RED could appear in red and the other words in black.

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The whole of the CB sheet could of course have a dry carbon coating, and printing could occur directly on the CB sheet.

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CLAIMS

- 5 1. A pressure sensitive copying sheet having a CB coating and a dry carbon printing medium applied to the CB coating.
- 10 2. A pressure sensitive copying sheet according to claim 1 in which the adhesion between the dry carbon printing medium and the CB coated surface of the sheet prevents the dry carbon printing medium from readily rubbing off the CB sheet.
- 15 3. A pressure sensitive copying sheet according to claim 1 or claim 2 in which the dry carbon printing medium is coloured to give a coloured copy.
- 20 4. A pressure sensitive copying sheet according to any preceding claim in which the dry carbon printing medium is applied only to a region or regions of the sheet.
- 25 5. A pressure sensitive copying sheet comprising a CB sheet substantially as herein described.
- 30 6. Pressure sensitive copying sheets comprising a first sheet having a CF coating and a second sheet having a CB coating to which a dry carbon printing medium has been applied, the dry carbon printing medium being such as to allow the CB coating to react with the CF coating during copying.
- 35 7. Pressure sensitive copying sheets according to claim 6 in which the adhesion between the CB coated surface of the CB sheet and its dry carbon coating

prevents the dry carbon coating from readily rubbing off the CB sheet.

5 8. Pressure sensitive copying sheets according to claim 6 or claim 7 in which the dry carbon printing medium is coloured to give a coloured copy on the CF sheet.

10 9. Pressure sensitive copying sheets according to any one of claims 6 to 8 in which the dry carbon printing medium is applied only to a region or regions of the CB sheet.

15 10. Pressure sensitive copying sheets according to claim 9 which are adapted to produce a copy on the CF sheet having regions of different copy boldness.

20 11. Pressure sensitive copying sheets substantially as herein described.

25 12. A manifold form for the manifold production of copies of a form incorporating at least one pressure sensitive copying sheet according to any one of claims 1 to 5.

25 13. A manifold form for the manifold production of copies of a form incorporating at least one pair of pressure sensitive copying sheets according to any one of claims 6 to 11.

30 35 14. A continuous assembly for forming envelopes and corresponding enclosures comprising a first series of sheets adapted to form enclosures and an associated corresponding second series of pressure sensitive sheets which are adapted to form envelopes, the pressure sensitive sheets comprising sheets according

to any one of claims 1 to 6 and being arranged so that the surface of the pressure sensitive sheets having the CB coating to which the dry carbon printing medium has been applied is next to a surface of the corresponding second sheets so that pressure applied to the assembly causes the dry carbon coating to be transferred to the second sheets.

15. A continuous assembly for forming envelopes and
10 corresponding enclosures comprising a first series of sheets which are adapted to form enclosures and a corresponding second series of sheets which are adapted to form envelopes associated with the first series of sheets, in which the corresponding sheets of the first
15 and second series of sheets comprise pressure sensitive sheets according to any one of claims 6 to 11 being arranged so that the surface of each said second sheet having the CB coating to which the dry carbon printing medium has been applied is next to the surface of the corresponding first sheet to which the CF coating has
20 been applied so that pressure applied to the assembly causes the CF sheet to be marked by the pressure sensitive reaction between the CB and CF paper and the dry carbon printing medium.

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16. A continuous assembly according to claim 14 or claim 15 in which the first series of sheets comprises cheques or the like.

30 17. A continuous assembly substantially as described herein.

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